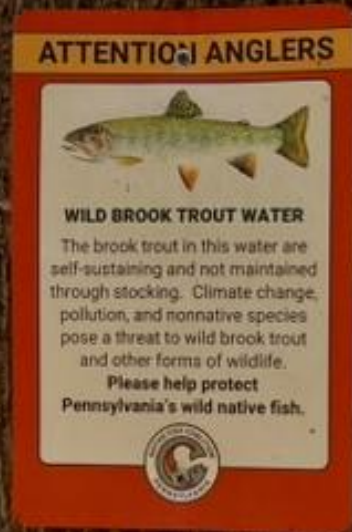


It's everywhere, but is it toxic? A Basin-Wide Survey of 6PPD-Q in Brook Trout water of the Delaware River Basin

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Delaware River Basin Commission

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Death by dirty water: Storm runoff a risk for fish



POULSBO, Wash. -- Just hours into the experiment, the prognosis was grim for salmon that had been submerged in rain runoff collected from one of Seattle's busiest highways. One by one, the fish were removed from a tank filled with coffee-coloured water and inspected: They were rigid. Their typically red gills were gray.

"He's way dead," David Baldwin, a research zoologist with the National Oceanic and Atmospheric Administration's Northwest Fisheries Science Center, declared at the four-hour mark.

Monday, November 17, 2014



AP



Urban Runoff Mortality Retrospective

Jenifer McIntyre, Ph.D.
Washington State U.



Tire Wear Particles



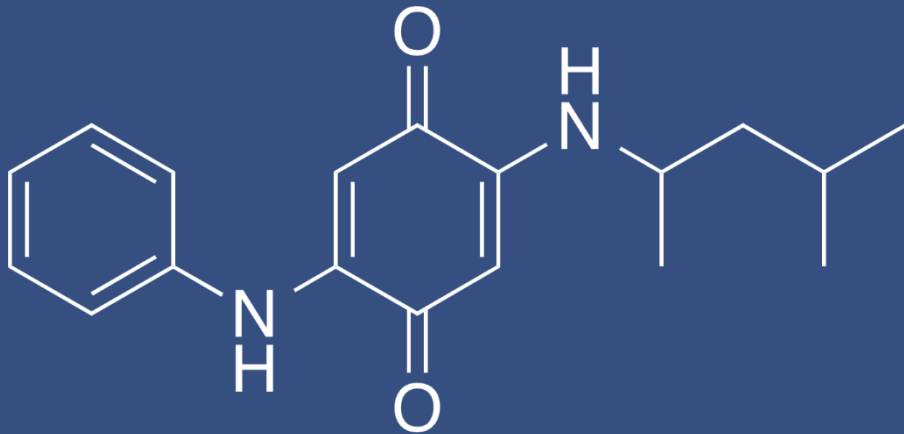
7-12 lbs generated annually per person in the U.S.





What Makes Tire Wear Particles Toxic?

6PPD & 6PPD-Q: *Background and Properties*



- 6PPD is used in tires and other rubber car parts
- 6PPD-Q environmental behavior & properties
 - Solubility 0.67 mg L⁻¹
 - Half-life in water is 33 hrs
 - Bonds with sediment

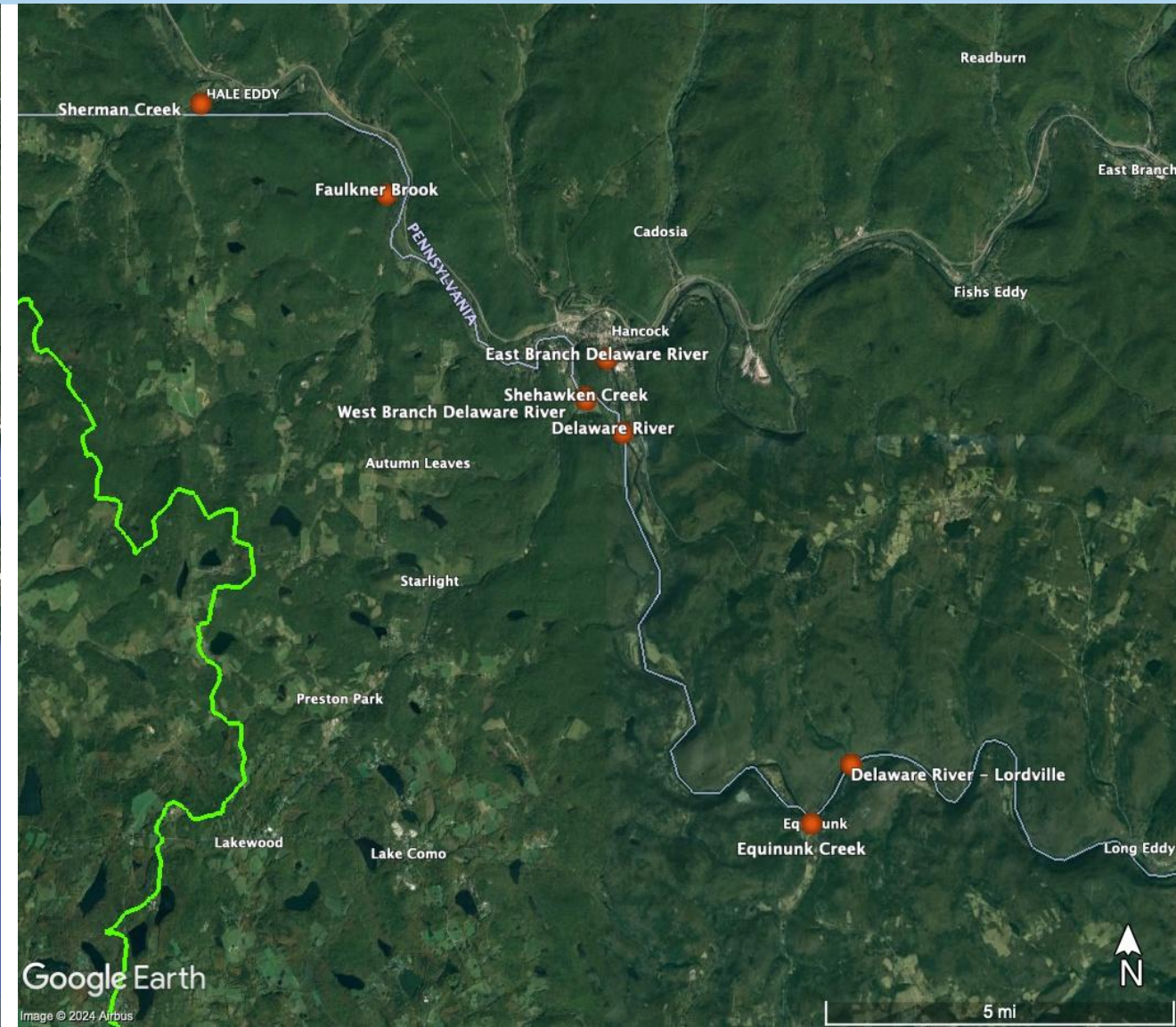
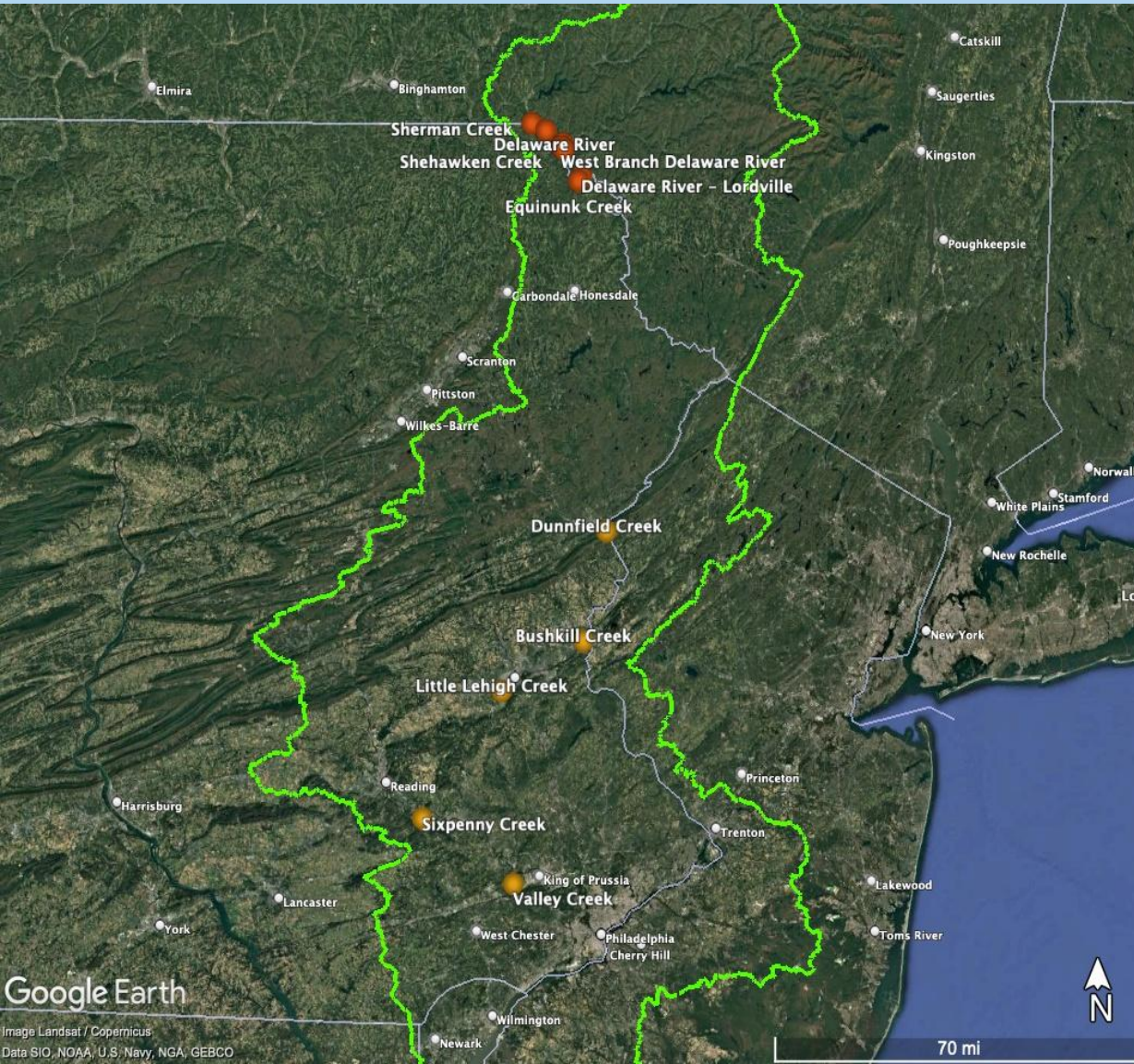
6PPD-Q Toxicity... so far

Common Name	Species	LC ₅₀ (ng L ⁻¹)	Test Duration	Endpoint	Reference
Coho Salmon	Oncorhynchus kisutch	41	24h	Mortality	(Lo et al. 2023)
		80.4	24h	Mortality	(Greer et al. 2023)
		95	24h	Mortality	(Tian et al. 2022)
Brook Trout FRY	Salvelinus fontinalis	200	24h	Mortality	(Philibert et al. 2024)
Brook Trout	Salvelinus fontinalis	590	24h	Mortality	(Brinkmann et al. 2022)
Rainbow Trout	Salvelinus fontinalis	640	96h	Mortality	(Nair et al. 2023)
		Brook Trout Fry (<2 inches): LC50 = 80 ng L ⁻¹ w/ ~70 min exposure Brook Trout Fingerlings (2-4 inches) = 230 ng L ⁻¹ w/ ~65 min exposure			
Brown Trout	Salvelinus fontinalis	Philibert, D.; Stanton, R. S.; Tang, C.; Stock, N. L.; Benfey, T.; Pirrung, M.; de Jourdan, B. The Lethal and Sublethal Impacts of Two Tire Rubber-Derived Chemicals on Brook Trout (Salvelinus Fontinalis) Fry and Fingerlings. <i>Chemosphere</i> 2024, 360, 142319.			(2022)

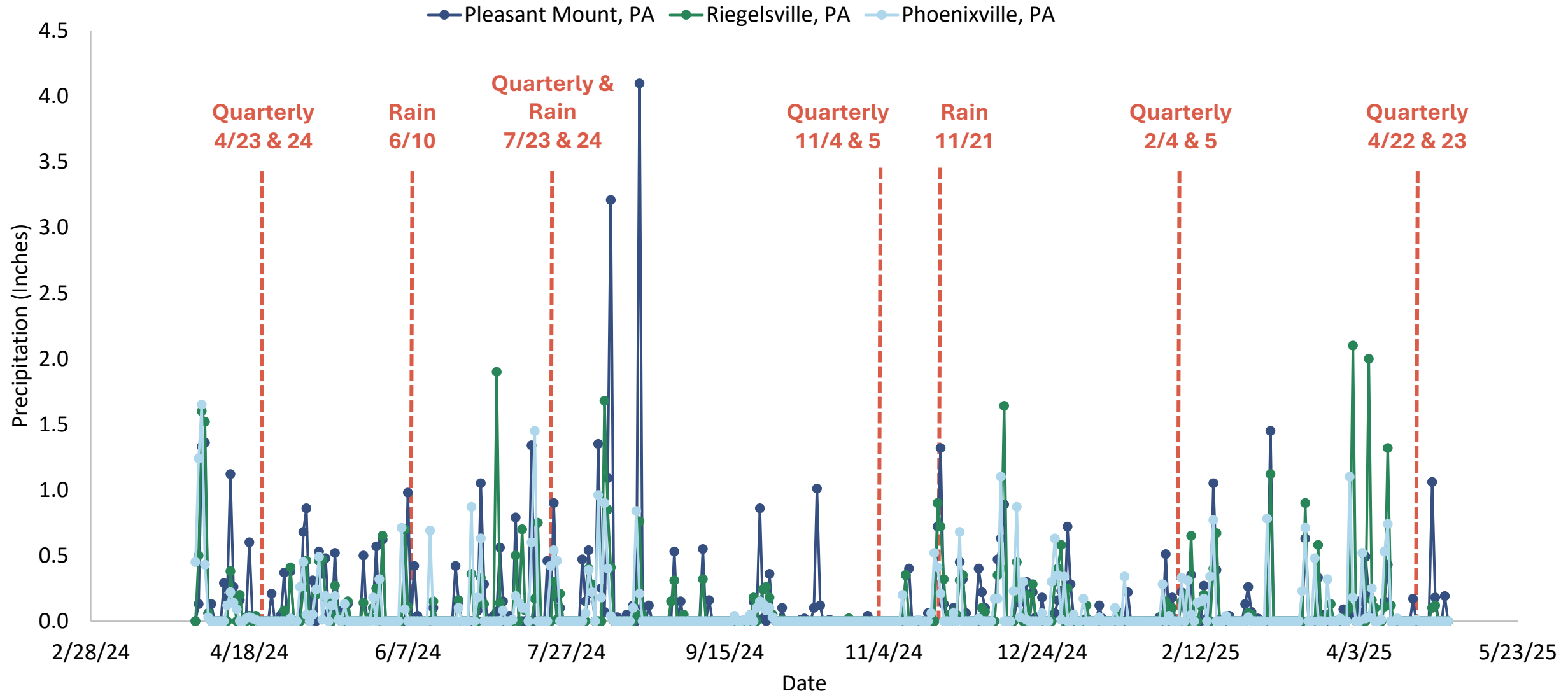
ITRC (Interstate Technology & Regulatory Council). 2024. 6PPD & 6PPD-quinone **Table 2-1**. Washington, D.C.: Interstate Technology & Regulatory Council, Tire Anti-degradant (6PPD) Team. www.itrcweb.org.



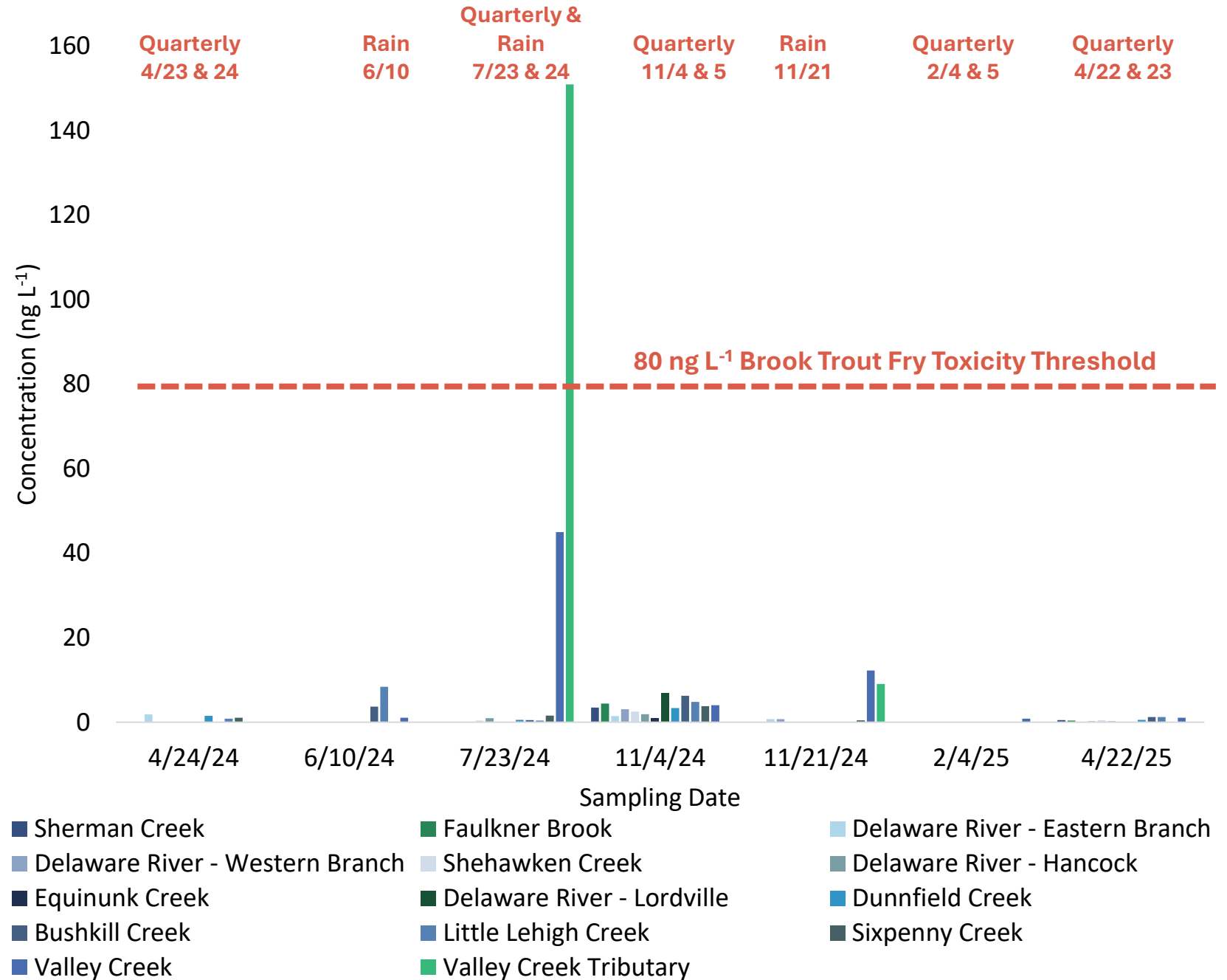
Studying 6PPD-Q in the Delaware River Basin



Precipitation During the Study



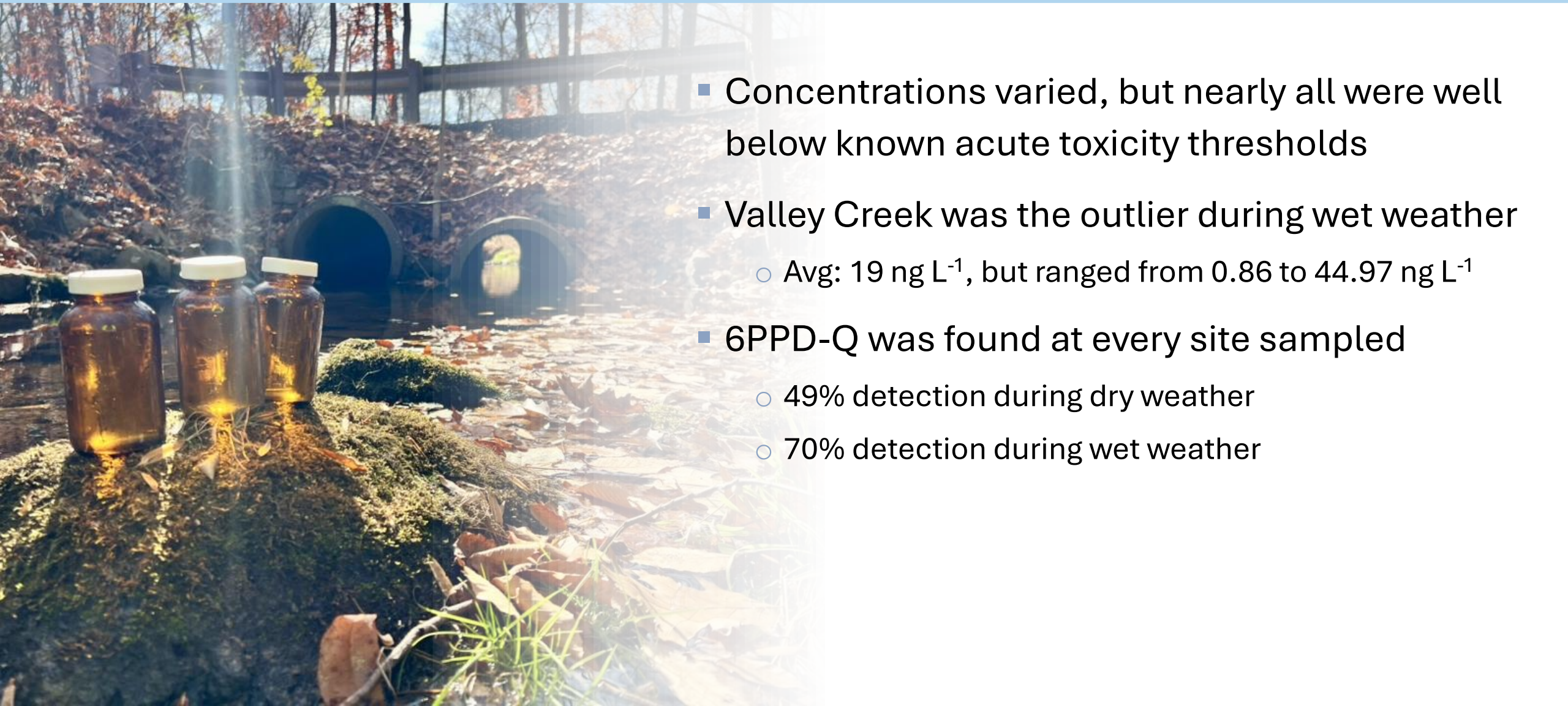
Valley Creek Stands out



6PPD-Q Was Found at Every Site



Present, but largely below Toxicity Thresholds

- 
- Concentrations varied, but nearly all were well below known acute toxicity thresholds
 - Valley Creek was the outlier during wet weather
 - Avg: 19 ng L⁻¹, but ranged from 0.86 to 44.97 ng L⁻¹
 - 6PPD-Q was found at every site sampled
 - 49% detection during dry weather
 - 70% detection during wet weather

Additional Points & Future Efforts

- During November drought, 6PPD-Q detected at every site
- Sublethal toxicity thresholds are not well known
- Future
 - Planning a study for additional streams using a USGS tool that scores watersheds based on 6PPD-Q threat



<https://geonarrative.usgs.gov/6ppdqsource/dashboard/>



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6PPD-Q is present daily, but not at acute levels. Stormwater events could temporarily spike concentrations to levels of concern in the lower basin. We still have a lot to learn, especially about sub-lethal toxicity thresholds.

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